CLAIMS

What is claimed is:

1. A method for deep cryogenic tempering of brake components, the method comprising the steps of:

(a) placing a brake component at a temperature within a cryogenic processing chamber;

(b) cooling the brake component at a descent rate until the brake component temperature is approximately –300° F;

(d) maintaining the brake component temperature at –300° F for a stay time;

(e) raising the temperature of the brake component to approximately 300° F at an ascent rate;

(f) maintaining the temperature of the brake component at 300° F for a post temper time; and

(g) lowering the temperature of the brake component to room temperature at a cool down rate.

2. The method of Claim 1, wherein steps (e), (f), and (g) are repeated at least once.

3. The method of Claim 1, wherein steps (e), (f), and (g) are repeated twice for a second post temper time and a third post temper time.

4. The method of Claim 3, wherein:

the brake component temperature is approximately 100 degrees F at step (a).

5. The method of Claim 1 further comprising the step of:

raising the temperature of the brake component to approximately –100° F within the cryogenic processing chamber after step (d) and before step (e).

6. The method of Claim 5 further comprising the step of:

transporting the brake component to a tempering oven after the temperature of the brake component is approximately –100° F.

7. The method of Claim 1 further comprising the step of transporting the brake component to a tempering oven during step (e).

8. The method of Claim 1, wherein the cooling of the brake component is accomplished by introducing gaseous nitrogen into the cryogenic processing chamber.

9. A cryogenically tempered brake component, the brake component comprising:

a material;

a geometrical cross section;

a mass; and

an improved molecular structure,

wherein the improved molecular structure is dependent on the material, the geometrical cross section, and the mass.

10. The cryogenically tempered brake component of Claim 9, wherein the brake component further comprises a brake rotor.

11. The cryogenically tempered brake component of Claim 9, wherein the brake component further comprises a brake drum.

12. A cryogenically tempered brake component having an improved molecular structure achieved by cooling the brake component to approximately –300° F, wherein the brake component has improved structural properties.

13. The cryogenically tempered brake component of Claim 12, wherein the improved structural property is improved warpage resistance.

14. The cryogenically tempered brake component of Claim 12, wherein the improved structural property is improved heat resistance.

15. The cryogenically tempered brake component of Claim 12, wherein the improved structural property is reduced heat checking.

16. The cryogenically tempered brake component of Claim 12, wherein the improved structural property is reduced fading.

17. The cryogenically tempered brake component of Claim 12, wherein the improved structural property is reduced cracking.

18. A cryogenically tempered brake component made by the process of:

cooling the brake component to approximately –300° F, and maintaining the brake component at approximately –300° F for a stay time;

subsequently heating the brake component to approximately 300° F, and maintaining the brake component at approximately 300°F for a post temper time; and

cooling the brake component to ambient temperature.

19. A cryogenically tempered brake component made by a process of cooling the brake component to approximately –300° F and heating the brake component to approximately 300° F according to a processing profile that improves a service life of the brake component.

20. The cryogenically tempered brake component of Claim 19, wherein the service life of the brake component is achieved by improved warpage resistance.

21. The cryogenically tempered brake component of Claim 19, wherein the service life of the brake component is achieved by improved heat resistance.

22. The cryogenically tempered brake component of Claim 19, wherein the service life of the brake component is achieved by reduced heat checking.

23. The cryogenically tempered brake component of Claim 19, wherein the service life of the brake component is achieved by reduced fading.

24. The cryogenically tempered brake component of Claim 19, wherein the service life of the brake component is achieved by reduced cracking.